

Study on the Influence of Sea Level Rise on EDPs and Culture of Island Countries

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Abstract: The rising sea level caused by climate change affects the safety of the people and the survival of the culture in island countries seriously. The resettlement of people displaced by environmental damage and the protection of culture of these countries have become a series of problems to be solved. Based on the impact of sea-level rise on environmentally displaced persons (EDPs) and the risk of cultural loss in island countries, this paper uses qualitative and quantitative methods, takes Maldives as an example and proposes relevant measures for EDPs' resettlement and cultural protection by combining with the Single Linear Regression model.

1. Introduction

With the development of society, vast quantities of carbon dioxide has been causing the melting of glaciers and the uprising of sea levels all around the world. Several island nations, such as The Maldives and Tuvalu have been at risk of completely disappearing due to their low terrain. And this paper aims to analyze the impact of sea level rise on the number of EDPs and cultural loss.

2. Analysis of the Problem

For the problem of the number of people at risk, according to collecting the time series data of the number of EDPs and the total land area (S) of Maldives over the years, this paper establishes a linear regression model of one variable. According to the linear regression equation of one variable:

$$P = C + \beta S \quad (1)$$

This paper uses the Least Square Method to solve the linear regression model of Maldives population (P) with respect to land area (S).

As the other problem of the risk of cultural loss, according to collecting the time series data of the cultural industry trade volume (D) and the total land area (S) of Maldives over the years, suppose that the cultural loss is only related to the reduction of land area caused by sea level rise. Therefore, this paper chooses to establish a linear regression model. According to the linear regression equation of one variable:

$$D = C + \alpha S \quad (2)$$

Finally, this paper uses the Least Square Method to solve the unitary linear regression model of Maldives' national cultural industry trade volume (D) with respect to the total land areas.

3. Assumptions

This paper assumes the following conditions:

- 1) The land area (S) of Maldives is only affected by sea level height.
- 2) The cause of EDPs in Maldives is the sea-level rise caused by the Greenhouse Effect.

4. Symbol Descriptions

Table 1 Symbol Descriptions.

Variable symbol	Instructions	Variable symbol	Instructions
EDPs	environmentally replaced persons	S	total land area
D	trade volume of national cultural industry	C	constant
β	parameter value	α	parameter value
T	T statistics	P	P statistics

5. Establishment of Models

5.1. Model and Solutions for the Number of People At Risk

5.1.1. Data Collection and Analysis

Assuming that the number of EDPs is the number of people at risk, and whether the rise of sea level has a significant impact on the increase of the number of EDPs, this paper collects the total land area (S) and environmental flow of Maldives in 2008-2018 through the official website of China National Bureau of statistics Data of EDPs and other panels are shown in the table below.

Table 2 Data of The Total Land Area (s) and Edps (Edp) of Maldives in 2008-2018.

Year	EDPs(EDP) Unit: person	Total land area(S) Unit: square kilometers	Year	EDPs(EDP) Unit: person	Total land area(S) Unit: square kilometers
2008	16	298.98	2014	36	298.11
2009	16	298.9	2015	42	298.05
2010	19	298.79	2016	57	297.96
2011	21	298.66	2017	54	297.89
2012	24	298.51	2018	73	297.8
2013	31	298.38			

By importing the collected panel data such as total land area (S) and EDPs into SPSS for correlation analysis and Pearson correlation coefficient test, this paper finds that there is a significant negative correlation between total land area (S) and EDPs, which can be preliminarily judged that the reduction of total land area (S) for the environment increases the number of EDPs.

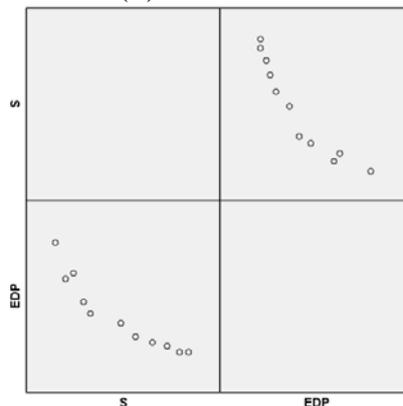


Figure1 There is a Significant Negative Correlation between Total Land Area (s) and Environmentally Displaced Persons (Edps).

5.1.2. Model the Number of People at Risk

Considering the establishment of a linear regression model with the total land area (S) as the independent variable and the number of EDPs as the dependent variable:

$$EDP = C + \beta S \quad (3)$$

In the establishment of the model, according to the data in Table 2, this paper fits out the univariate linear regression equation by using Eviews analysis. This paper tests the significance

level between the equation and variables through the Goodness of Fit test, F test, T test and other tests and judge whether the reduction of the total land area (S) has a significant impact on the increase of the number of EDPs, so as to establish a univariate linear regression model.

5.1.3. Solution of Model 1

According to the total land area (S) and the number of EDPs, and according to the linear regression model:

$$EDP = C + \beta S \quad (3)$$

This paper can get one variable linear regression equation:

$$\hat{EDP} = 12500.487 - 41.778S \quad (4)$$

According to the output results of the linear regression equations obtained by Eviews, the adjustment determinable coefficient of Goodness of Fit test is 0.935, the P value corresponding to the F test statistic is 0.00 far less than 0.05, which can preliminarily judge the significance of the linear regression equation. The P value corresponding to the T test statistic corresponding to the coefficient is 0.00, which can judge the significance of the parameter.

To sum up, this paper concludes that the fitting degree of the following model is good. For each unit reduction of the total land area (S), the number of EDPs will increase by 41.778 units. Therefore, this paper judges that the total land area (S) has a significant impact on the number of EDPs, and the rise of sea level has a significant effect on the increase of the number of people at risk.

5.2. Model and Solutions for the Risk of Cultural Loss

5.2.1. Data Collection and Analysis

Assuming that the national cultural industry trade volume (D) of Maldives represents the culture of Maldives, and whether the rise of sea level has a significant impact on the national cultural industry trade volume (D), this paper collects the Maldives in 2008-2018 through the official website of China National Bureau of statistics See the following table for panel data of total land area (S) and cultural industry trade volume (D) of surrounding countries.

Table 3 Data of Trade Volume of National Cultural Industry (d) and Total Land Area (s) of Maldives in 2008-2018.

Year	Trade volume of national cultural industry (D) unit: 10000 yuan	Total land area (S) Unit: square kilometers	year	Trade volume of national cultural industry (D) unit: 10000 yuan	Total land area (S) Unit: square kilometers
2008	16892	298.98	2014	16036	298.11
2009	16322	298.9	2015	15986	298.05
2010	16212	298.79	2016	16084	297.96
2011	16300	298.66	2017	15634	297.89
2012	16112	298.51	2018	15602	297.8
2013	16052	298.38			

By importing the collected panel data such as total land area (S) and national cultural industry trade (D) into SPSS for correlation analysis and Pearson correlation coefficient test, this paper concludes that there is a significant positive correlation between total land area (S) and national cultural industry trade (D), and this paper preliminarily judges that the reduction of total land area (S) leads to the decrease of trade volume (D) of national cultural industry.

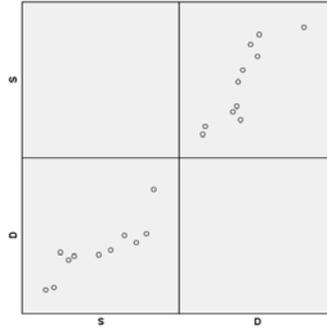


Figure 2 There is a Significant Positive Correlation between Total Land Area (s) and National Cultural Industry Trade (d).

5.2.2. Model the Risk of Cultural Loss

This paper makes a preliminary analysis of the risk of cultural loss, considers the impact of sea-level rise on culture, and analyzes the functional relationship between the total land area (S) of Maldives and the trade volume (D) of national cultural industry. Considering the total land area (s) as independent variable and the trade volume of national cultural industry (D) as dependent variable, this paper establishes a linear regression model:

$$D = C + \alpha S \quad (2)$$

According to the data in Table 3, this paper uses Eviews analysis to fit the univariate linear regression equation. Through the Goodness of Fit test, F test, T test and other tests to test the significance level between the equation and variables, this paper judges whether the reduction of total land area (S) has a significant impact on the reduction of national cultural industry trade volume (D), so as to establish a univariate linear regression model.

5.2.3. Solution of Model 2

According to the data of the total land area (S) and the trade volume (D) of national cultural industry in Maldives, and according to the linear regression model:

$$D = C + \alpha S \quad (2)$$

Using Eviews, the preliminary equation is as follows:

$$\hat{D} = -192123.99 + 697.92S \quad (5)$$

According to the output results: the adjustment coefficient of the equation Goodness of Fit test is 0.857, and the P value corresponding to the F test statistic is less than 0.05, so the fitted equation is significant. However, according to the T test of the coefficient corresponding to the variable, the P value corresponding to the total land area (S) T statistic of Maldives is less than 0.05, so the parameter is significant.

To sum up, it can be concluded that the fitting degree of the following model is good. For each unit reduction of the total land area (S), the trade volume (D) of the national cultural industry will slow down by 697.92 units. Therefore, it can be judged that the reduction of the total land area (S) has a significant impact on the reduction of the trade volume (D) of the national cultural industry.

6. Evaluation and Extension of the Model

6.1. Evaluation

6.1.1. Strengths

1) The model this paper establishes can be closely linked with the actual situation. This paper combines the actual situation to solve the problems, so the model is closer to the reality, more universal and more extensive.

2) The univariate linear regression model drawn by Eviews software has good Goodness of Fit, simple operation and easy popularization.

6.1.2. Weaknesses

There are many complex factors in the model, which can not be considered comprehensively. For example, the factors that affect cultural loss should also include regional factors, economic development factors and policy factors, which are not taken into account, resulting in some errors with the actual situation.

6.2. Extension

Through the established model and the solution results, this paper can get the influencing factors of cultural loss and the number of people at risk, and provide a strong basis for human rights and cultural protection. The application of the model is of great practical significance.

7. Conclusion

To sum up, the issue of EDPs is quite complex. In addition to building models, some qualitative measures have been considered by the international community. For example, human rights are firstly recognized by the Paris agreement in 2015^[1],” Nansen initiative” meeting reached an guidance document related to EDPs^[2]; Proposal for the protection of traditional culture and folklore is adopted by the general conference of UNESCO at its 25th session in September 1989^[3], etc. What’s more, the dialogue mechanism for officials and experts from relevant member states to exchange experiences with each other should be established. Developed countries should take more responsibility to help developing countries cope with the negative effects of climate change^[4]. This paper believes that the issue of EDPs will be solved successfully under the teamwork of every countries and our common islands, our common home will go on.

References

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